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TECHNICAL MEMORANDUM

TO: Camille Hueni, EPA Task Order Monitor

FROM: Pat Appel, EA Project Manager

DATE: 29 November 2016



SUBJECT: October 2016 Vapor Intrusion Sampling Technical Memorandum, Jones Road Ground Water Plume Superfund Site, Texas

1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has authorized EA Engineering, Science, and Technology, Inc., PBC (EA) under Remedial Action Contract (RAC) No. EP-W-06-004, Task Order No. 0129-RARA-06NK, to perform an indoor air monitoring event to analyze seasonal indoor air quality in the occupied space near the release and ISB treatment area, at the Jones Road Ground Water Plume Superfund Site (Site). EA executed the RA for the Site as defined in the September 2010 *Record of Decision* (ROD) (EPA 2010) and in accordance with the RA Work Plan dated August 2015 (EA 2015a) and the RA Work Plan Revision 01 dated August 2016 (EA 2016).

2. SITE DESCRIPTION AND BACKGROUND

The Site is located in the northwest portion of Harris County, Texas (Figure 1). The source of contamination is the former Bell Dry Cleaners facility, which was located within the Cypress Shopping Center at 11600 Jones Road, approximately 0.5 miles north of the intersection of Jones Road and Farm-to-Market (FM) 1960, outside the city limits of northwest Houston, Texas. The Cypress Shopping Center was constructed in 1984, and the former Bell facility began dry cleaning operations sometime in 1988, using perchloroethylene (PCE), also known as tetrachloroethene. The former Bell facility continued operating through May 2002 when the dry cleaning operations were shut down. The hazardous substances present at the Site include PCE and related daughter products trichloroethylene (TCE), cis-1,2-dichloroethylene (DCE), and vinyl chloride.

The site was proposed to the National Priorities List (NPL) on 30 April 2003 (68 Federal Register 23094, 30 April 2003), and finalized to the NPL on 29 September 2003 (68 Federal Register 55875, 29 September 2003) (EPA 2010). The ROD for the site (EPA 2010) was signed on 23 September 2010, and sets forth the selected remedy. There is only one planned operable unit for the site and the selected remedial action is intended to address all areas of concern. The selected remedy was Alternative 4, *In Situ* Enhancements to Pump and Treat. The *in situ* treatments involve treating the soil and ground water without removing them. The selected

remedy also includes the implementation of institutional controls. A focused remedial action took place November 2015 through June 2016. A targeted *in situ* bioremediation RA was performed at the Site that included a baseline monitoring event, injection of EHC-L® into the shallow water-bearing zone followed by a three-month post-injection monitoring event.

3. OCTOBER 2016 VAPOR INTRUSION FIELD INVESTIGATION

In October 2016, the Vapor Intrusion (VI) sampling was conducted to evaluate the potential for VI risk from shallow source materials underlying the building and original point of release. Field activities were completed within the former dry cleaning facility, within the two adjacent retail locations to the east of the former dry cleaner location, and at outdoor locations. Field activities included building surveys, leak-check testing, and sub-slab soil gas, indoor air, and outdoor air sampling. Field activities were performed in accordance with the SAP (EA 2015b).

4. Summary of Results

Prior to conducting a multiple-lines-of-evidence VI assessment for data generated during this evaluation the nature and extent of contamination found during this investigation, EA reviewed all laboratory analytical data and generated a data validation report, Attachment A. Validated sample results were compared to the EPA Regional Screening Levels (RSLs) for a commercial exposure scenario. Results for the sub-slab soil gas and indoor/outdoor air samples are presented in Table 1 and Figure 1.

Sub-Slab Soil Gas Results

PCE, TCE, 1,1-DCE, and vinyl chloride were found at elevated concentrations (up to 1,100,000 $\mu\text{g}/\text{m}^3$, 150,000 $\mu\text{g}/\text{m}^3$, 12,000 $\mu\text{g}/\text{m}^3$, and 520,000 $\mu\text{g}/\text{m}^3$ respectively) in soil gas beneath the shopping center concrete foundation slab. PCE, TCE, and vinyl chloride exceeded its screening criteria of 580 $\mu\text{g}/\text{m}^3$, 29 $\mu\text{g}/\text{m}^3$, and 93 $\mu\text{g}/\text{m}^3$, respectively, at each of the six sampling locations. Additionally, two of the sampling locations at the Former Bell Dry Cleaners also exceeded the 1,1-DCE screening criteria of 2,900 $\mu\text{g}/\text{m}^3$. Concentrations generally decrease moving east to west, away from the former Bell Dry Cleaners and discharge location.

Indoor Air Results

PCE, TCE, and vinyl chloride were found at elevated concentrations (up to 59 $\mu\text{g}/\text{m}^3$, 9.1 $\mu\text{g}/\text{m}^3$, and 14 $\mu\text{g}/\text{m}^3$ respectively) in indoor air samples collected from areas co-located with sub-slab soil gas sampling points. PCE, TCE, and vinyl chloride exceeded its screening criteria of 18 $\mu\text{g}/\text{m}^3$, 0.88 $\mu\text{g}/\text{m}^3$, and 2.8 $\mu\text{g}/\text{m}^3$, respectively, at four of the sampling locations. The sampling locations where exceedances were observed were located in the former Bell Dry Cleaners and the former hair salon.

5. Recommendations

The results from the December 2015 and October 2016 VI investigation indicate the former Bell Dry Cleaners facility and adjacent building have been impacted by VOC soil gas including PCE,

TCE and vinyl chloride. These VOCs have migrated throughout the lateral extents of the sub-slab environment and into indoor air at several locations. The detection of vinyl chloride and increased TCE concentrations fully support a complete VI pathway. It is also likely that the *in situ* bioremediation injection work accelerated degradation of VOCs and increased soil gas concentrations, which created conditions more favorable for VI occurrence (e.g., higher VOC soil gas concentrations than attenuation rates across the buildings foundation slab).

Currently the TCE indoor air concentrations have a noncancer hazard of one. Vinyl chloride is more toxic than TCE. Vinyl chloride detections in indoor air are higher than the commercial air RSL, however, the RSL for vinyl chloride is based upon a cancer endpoint. While the vinyl chloride detections are above the RSL, they are still well below the upper end of the acceptable cancer risk range. Therefore, vinyl chloride levels are acceptable but should be monitored because the sub-slab soil gas levels appear high enough that they could cause a concern for indoor air.

The EPA Region 9 Memorandum regarding exposures to TCE in air indicates that the TCE indoor levels documented at the site would fall into a category requiring an accelerated response, defined as “recommend early or interim mitigation measures be evaluated and implemented quickly, and their effectiveness confirmed promptly” (EPA 2014). The Region-10 Memorandum recommends that average exposures over any 21-day period of time not exceed these levels (EPA 2013).

Several vapor mitigation technologies are available for existing building, including: increasing ventilation, sealing foundational and wall opening (cracks, holes, and chips), and sub-slab depressurization (SSD). However, increasing ventilation and sealing foundational openings may not be capable of reducing indoor air concentrations to acceptable levels. In order to mitigate the pathway, a SSD system (SSDS) is recommended.

Installation and operation of an SSDS creates a negative pressure gradient across the building slab (a lower pressure beneath the slab than above the slab); thus, hindering VI into the building. This negative pressure gradient is obtained by extracting soil gas from beneath the slab using a vacuum. If deemed necessary by state guidance on air emissions, the extracted vapor is then treated prior to discharging the vapor to the atmosphere above the roofline. The integrity of the building slab and wall are also inspected and any cracks, holes or chips that may serve as paths for VI would be sealed.

6. REFERENCES

EA Engineering, Science, and Technology, Inc., PBC (EA). 2015. Remedial Action Work Plan for Jones Road Ground Water Plume Superfund Site, Houston, Harris County, Texas. August.

———. 2016a. Remedial Action Work Plan for Jones Road Ground Water Plume Superfund Site, Houston, Harris County, Texas. Revision 01. August.

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U.S. Environmental Protection Agency (EPA). 2010. Record of Decision, Jones Road Ground Water Plume Superfund Site, Harris County, Texas. September.

———. 2012. Technical Memorandum. OEA Recommendations Regarding Trichloroethylene Toxicity in Human Health Risk Assessments. 13 December.

———. 2014. Technical Memorandum. EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion. 9 July.

Figures

- 1 Vapor Intrusion Sampling Locations and Concentrations

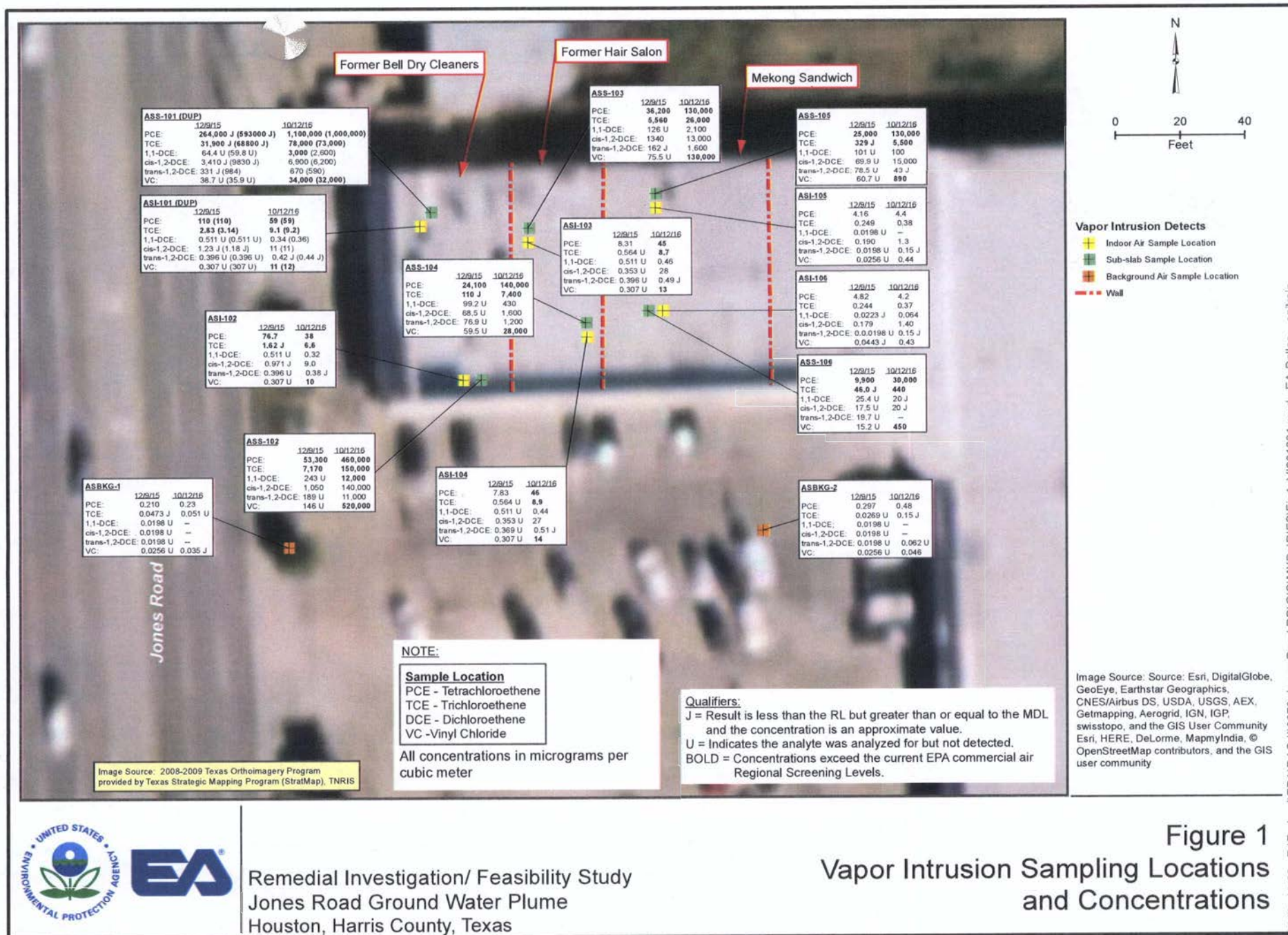
Tables

- 1 Vapor Intrusion Air Summary Data Table

Attachment

- A Laboratory Report

Figures



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Tables

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TABLE 1. VAPOR INTRUSION AIR SUMMARY DATA TABLE

Building ID	Project Sample Identification	Sample Date	Sub-Slab Soil Gas						Indoor Air						Outdoor Air					
			EPA com-RSL ¹ (µg/m3)						EPA com-RSL ¹ (µg/m3)											
			PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	VC	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	VC	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	VC
Former Bell Dry Cleaners	ASI-101-12092015	12/9/2015	580	29	2,900	NS	NS	93	110	2.83	0.511 U	1.23 J	0.396 U	0.307 U						
	ASI-101-DUP-12092015	12/9/2015							110	3.14	0.511 U	1.18 J	0.396 U	0.307 U						
	ASI-101-10122016	10/12/2016							59	9.1	0.34	11	0.42 J	11						
	ASI-101-DUP-10122016	10/12/2016							59	9.2	0.36	11	0.44 J	12						
	ASS-101-12092015	12/9/2015	264,000 J	31,900 J	64.4 U	3,410 J	331 J	38.7 U												
	ASS-101-DUP-12092015	12/9/2015	593,000 J	68,800 J	59.8 U	9,830 J	984 J	35.9 U												
	ASS-101-10122016	10/12/2016	1,100,000	78,000	3,000	6,900	670	34,000												
	ASS-101-DUP-10122016	10/12/2016	1,000,000	73,000	2,600	6,200	590	32,000												
	ASI-102-12092015	12/9/2015							76.7	1.62 J	0.511 U	0.971 J	0.396 U	0.307 U						
	ASI-102-10122016	10/12/2016							38	6.6	0.32	9.0	0.38 J	10						
Former Hair Salon	ASS-102-12092015	12/9/2015	53,300	7,170	243 U	1,050	189 U	146 U												
	ASS-102-10122016	10/12/2016	460,000	150,000	12,000	140,000	11,000	520,000												
	ASI-103-12092015	12/9/2015							8.31	0.564 U	0.511 U	0.353 U	0.396 U	0.307 U						
	ASI-103-10122016	10/12/2016							45	8.7	0.46	28	0.49 J	13						
	ASS-103-12092015	12/9/2015	36,200	5,560	126 U	1,340	162 J	75.5 U												
	ASS-103-10122016	10/12/2016	130,000	26,000	2,100	13,000	1,600	130,000												
	ASI-104-12092015	12/9/2015							7.83	0.564 U	0.511 U	0.353 U	0.396 U	0.307 U						
	ASI-104-10122016	10/12/2016							46	8.9	0.44	27	0.51 J	14						
Mekong Sandwich	ASS-104-12092015	12/9/2015	24,100	110 J	99.2 U	68.5 U	76.9 U	59.5 U												
	ASS-104-10122016	10/12/2016	140,000	7,400	430	1,600	1,200	28,000												
	ASI-105-12092015	12/9/2015							4.16	0.249	0.0198 U	0.190	0.0198 U	0.0256 U						
	ASI-105-10122016	10/12/2016							4.4	0.38	ND	1.3	0.15 J	0.44						
	ASS-105-12092015	12/9/2015	25,000	329 J	101 U	69.9 U	78.5 U	60.7 U												
	ASS-105-10122016	10/12/2016	130,000	5,500	100	15,000	43 J	890												
	ASI-106-12092015	12/9/2015							4.82	0.244	0.0223 J	0.179	0.0198 U	0.0443 J						
	ASI-106-10122016	10/12/2016							4.2	0.37	0.064	1.4	0.15 J	0.43						
Outside of Complex	ASS-106-12092015	12/9/2015	9,900	46.0 J	25.4 U	17.5 U	19.7 U	15.2 U												
	ASS-106-10122016	10/12/2016	30,000	440	20 J	20 J	ND	450												
	ASBKG-1-12092015	12/9/2015													0.210	0.0473 J	0.0198 U	0.0198 U	0.0198 U	0.0256 U
	ASBKG-1-10122016	10/12/2016													0.23	0.051 U	ND	ND	ND	0.035 J
	ASBKG-2-12092015	12/9/2015													0.297	0.0269 U	0.0198 U	0.0198 U	0.0198 U	0.0256 U
	ASBKG-2-10122016	10/12/2016													0.48	0.15 J	ND	ND	0.062 U	0.046

180 NC
47C

Under the
Screening
level -
Mitigation

28 C
440 No. Coning

47(C)
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8.8
3.0

Attachment A
Laboratory Report